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EVALUATION OF DOUGLAS-FIR TUSSOCK MOTH POPULATIONS IN EASTERN WASHINGTON, FALL OF 1963

by

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Defoliation of Douglas-fir and true fir trees by the Douglas-fir tussock moth, Hemerocampa pseudotsugata McD., in Stevens, Spokane, and Pend Oreille Counties of Eastern Washington was reported during the spring and summer of 1963. Examination in September 1963 showed 40 to 50 farm woodlots with moth infestations ranging from 1/4 acre to 25 acres in size. Infested trees were either completely stripped of foliage and dead or partly defoliated with the upper crown dead. Most infested areas were located in timber stands varying from a few to 200 acres in size. Exceptions were two small spot infestations near Eloika Lake where trees adjacent to large stands of mixed pine and fir were attacked.

Outbreaks of the tussock moth were recorded in this area in 1927-30, 1937-39, 1946-47, and 1955-57. During the outbreak in 1927 through 1930, over 300 million board feet of timber was killed on the Colville National Forest to the north of the current infestation.

Tree mortality occurs when the old and new foliage is consumed or damaged by feeding of the larva during June and July. Balch reports that extensive foliage damage is caused by feeding of the first three instars which eat out the underside of the needles. Large larval populations can strip a tree of its entire foliage in a few weeks.

After feeding ends in early August, the larva spins a cocoon in which it pupates and emerges as an adult. The cocoons are frequently spun on the underside of a twig, limb, or on the trunk. However, some larvae leave the tree and form a cocoon and pupate on the sides of buildings, fence posts, and other wooden material adjacent to the trees. The female moth is wingless and deposits her eggs in a mass on the outside of the cocoon from which she has emerged. The eggs overwinter and hatch the following spring. The newly hatched caterpillars are very light and hairy and wind dispersal in this stage is a major means of their dissemination. Spread may also occur through transportation of egg masses or larvae which become attached to vehicles or farm implements.

Dodge reported that tussock moth outbreaks are usually terminated when defoliation of the trees limits the moths' food supply or when parasitic insects, fungi, or a polyhedral virus disease attacks the moths. The virus disease acts rapidly and supposedly caused the collapse of moth populations during an outbreak in 1947 in the area now currently infested.

Some property owners sprayed for control of the moth during 1963 with various insecticides. Their degree of success varied, depending on the thoroughness of the application and the material used. Other owners in the area are planning to spray during 1964 if insect populations warrant. An accurate prediction of the moth population that will be present during June and July is required prior to that time so that spraying can be done before defoliation occurs in damaging intensity.

Evenden and Jost found that a quantitative comparison of the current and preceding years' egg masses was a good criterion of tussock moth population trend. Parasitism is a major factor in the fluctuation of the moth population, but an accurate evaluation of parasites requires year-long investigations during all stages of the moth's development. Little information is available on what constitutes a normal or abnormal parasite population.

An old and new egg mass count was made in the infested area to give the trend of the moth population and to aid in predicting the possibility of tree damage during 1964. Also a count was made of all parasitized pupae collected during the study. Three plots were selected in moth infested areas where no chemical control of the moth had been attempted during the past two years. Moth populations had been moderate in 1962 and heavy during 1963 at the first two plots selected and heavy at the third plot in 1963 with no information available for this plot in 1962.

On October 2, 1963, cocoon collections were made on the three selected plots. Branch ends 24 inches long were clipped at random from partly defoliated trees and all cocoons on each branch were collected. A minimum of 100 cocoons were collected on each plot. These cocoons were separated into four categories; those with old egg masses attached, those with new egg masses attached, those with emerged pupa but no eggs, and those containing dead pupae. The number and percent of cocoons collected in each category is summarized in the following table.

Number and percentage, by plots, of Douglas-fir tussock moth cocoons collected, Northeast, Washington, October 1963

Location	Cocoons								
	Number Collected	W/old eggs		W/new eggs		W/dead pupae		W/emerged pupae	
		No.	%	No.	%	No.	%	No.	%
S17, R42, T28	108	0	0	13	12	75	69	20	18
S16, R41, T28	148	9	6	24	16	73	50	42	28
S16, R42, T27	177	4	2	31	18	107	61	35	19
Total	433	13	3	68	16	255	59	97	22

The ratio of new egg masses to old masses was a little better than 5 to 1, with 68 new and 13 old, for a 523 percent increase in new masses. This may be compared with 207 new and 684 old masses that Dodge repprted finding during a survey of the same general area in 1955, with that outbreak collapsing in 1956. It may also be compared with the 450 percent increase of new egg masses over old that Evenden and Jost reported prior to the spraying of 413 thousand acres in Idaho, Oregon, and Washington to control the tussock moth in 1947.

Examination of dead pupae found in the collections showed that 17.6 percent of the total number of cocoons collected were parasitized. This was considerably below the 65.1 percent found parasitized by Dodge in 1955. The 59 percent found dead was less than the percent Dodge found parasitized. Johnson, in a 1947 study at Orofino, Idaho, found that 99.8 percent of the pupae he collected failed to emerge. He attributed most of this mortality to parasites with some mortality caused by a virus.

Egg parasites, predators, or a virus alone or in combination may occur in the study area to cause a moth population reduction. A virus, which has been a major factor in the halting of several tussock moth outbreaks in the Northwest, is the most likely one of the several biological controls that could occur. Hoever, this virus, according to Evenden and Jost, occurs too late in the feeding season to prevent defoliation.

The plots selected for this evaluation may not give a true picture of moth population trend for the whole area, but the results show that the tussock moth in these three areas is on the increase. Since tree mortality occurred in these areas in 1963, additional tree killing can be expected in 1964 unless some control agent appears and reduces the population before the young larvae do their damage in June and July.

No large scale control project should be needed in 1964 as the moth is not epidemic in large stands of host trees. Control on some farm woodlots will be required if additional tree mortality is to be prevented.

LITERATURE CITED

Balch, R. E.
1932. The fir tussock moth. Jour. of Econ. Ent. Vol. 25 (6).

Dodge, Harold R.
1956. An analysis of Douglas-fir tussock moth cocoons, winter of 1955-56, with reference to the trend of the current outbreak in Eastern Washington. Intermountain Forest and Range Exp. Sta., Ogden, Utah.

Evenden, James C. and E. J. Jost
1947. Tussock moth control, North Idaho, 1947. Forest Service, U. S. Dept. Agri., Missoula, Montana.

Johnson, Philip C.
1947. Development of infestations outside the treated area. Special section in tussock moth control, North Idaho 1947. Forest Service, U. S. Dept. Agri., Missoula, Montana.